Technology Advancements and HSI

The impact of Signal Processing and Automation Advancements on Submarine Sonar System HSI

Panel Overview

- High level overview of the impact of improved processing on operator workload
- The panelists' view of some of the challenges faced by the development community
- Group discussion

Background

Over the past several years the Advanced Processor Build (APB) process, used by the Submarine force to bring rapid capability improvements to the Fleet, has brought forward huge advancements in signal processing.

The byproduct of these processing gains is an exponential increase in the amount and type of data available to the operator interrogation and search.

This has resulted in a significant increase in search space and therefore workload.

Background

The issue of managing operator search space has been evolving since the 80's as new sensor and processing capabilities were introduced.

Initially, the principle approach to addressing this was the introduction of automated signal search and association tools.

More recently, the continued advances in processing capability have resulted in the introduction of a host of new automation processing types to help cue the operator to potential signals of interest.

Objectives

Improve and update today's system to enable the operator to better realize the performance gains provided through higher resolution sensors and processing in a tactically meaningful way.

Provide a more efficient approach for the operator to perform a thorough, effective search while maintaining control of the contact picture as the data and search space continues to grow.

Make the operator a part of the system versus a user of the system

Challenges to meeting the objectives

- Increased search space
- Making more of automation
- System evolution
- Changing roles

Challenge #1
Increased Search Space

Legacy Sonar

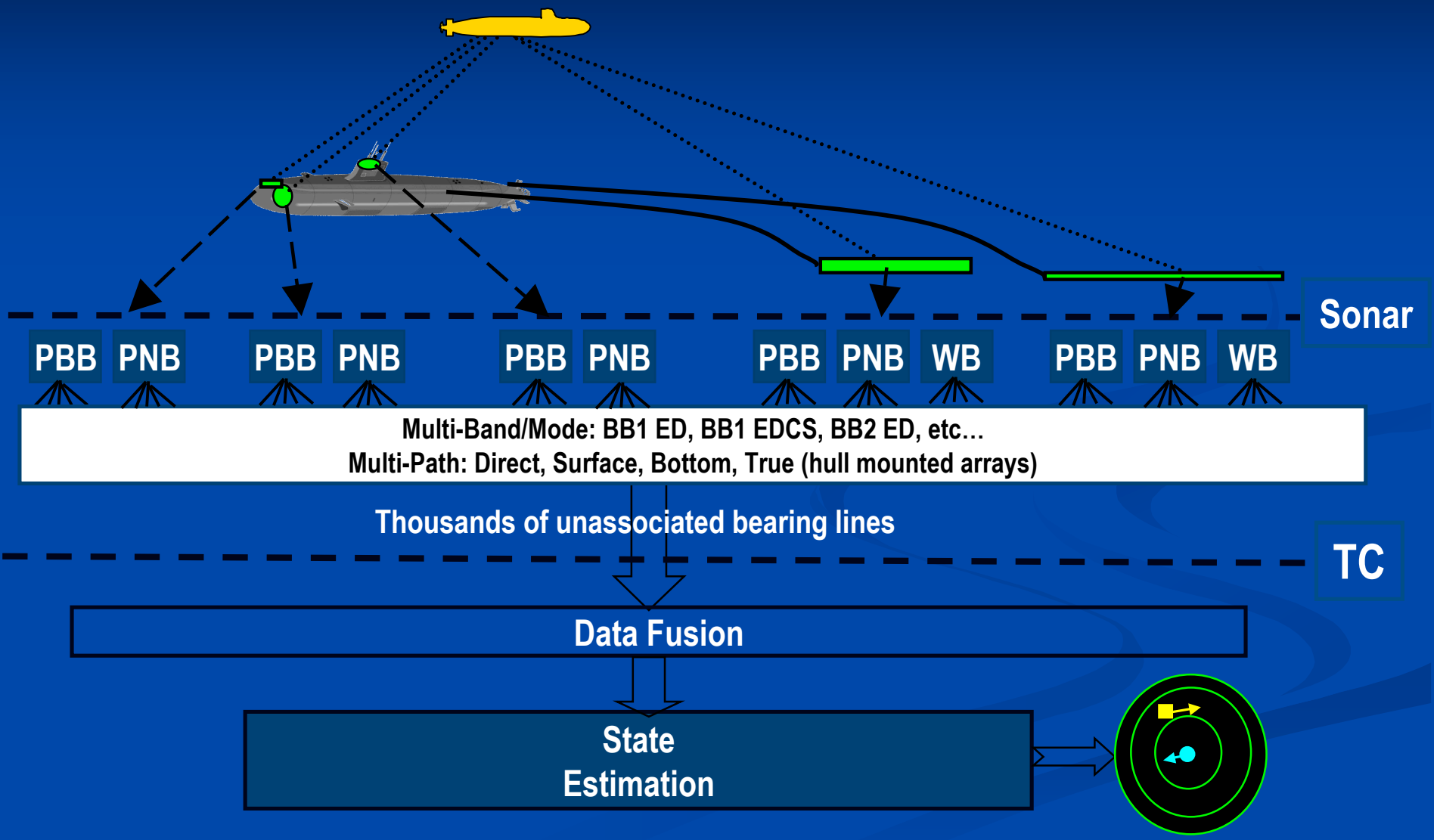
- Passive Broadband
  - ~50 beams
  - 1 processing band
  - 2 processing modes (mutually exclusive)
  - 3 Integration rates
- Passive Narrowband
  - ~50 beams
    - Single search resolution
    - High resolution data limited to Signals of interest in narrow bandwidths

Current Sonar

- Passive Broadband
  - >200 beams
  - 4 concurrent processing bands
  - 3 concurrent processing modes
  - 3 Integration rates
- Passive Narrowband
  - Over 7000 beams
    - Multiple bands of search resolution
    - Multiple bands of high resolution data at full spectrum

We utilize the same number of operators and consoles today

The operator's challenge today



Challenge #1

Increased Search Space

- How to effectively manage display real estate
  - Task definition
  - What types of data does the operator need to see and at what level (watch operator to command level)
  - Employment of drill down/data mining methods
  - Graphics, Symbology, and Icons
  - Finding key innovations through HSI

How do we find the needle in a haystack?

Challenge #2

Automation & the Operator

- Automation Past & Present
  - "Needle in the Haystack"
  - Focus on the "Haystack"
- How do we define automation?
- Operator Transformation
  - Move from building systems and training operators to use them to
  - Building systems that integrate the operator into the design

Challenge #2

Automation & the Operator

- Automation Past & Present
  - "Needle in the Haystack"
  - Focus on the "Haystack"
- How do we define automation?
- Operator Transformation
  - Train to Operate "System"
  - System Provides Actionable Information for Decision–Making

Challenge #3

System evolution

- Rapid development cycle
  - APB's are currently performed yearly
  - APBs typically feed the next production systems
- Working from a baseline
  - Evolution of existing components
  - Addition of new sensors and processing modes
- Technology Adoption
  - New technologies and capability continue to present new opportunities and challenges
  - Keep a balanced approach between the operator and technology selection

Challenge #4
Changing Roles

- Recognizing opportunities through role changes
  - "But that's how we've always done it!"
  - Change can be good
- Transitioning from OMI to HSI
  - Factoring in the operator early
- Coordination
  - operational guidelines, training, …
  - the layout of the platform itself

We need to revisit what we do, how we do it, and why.

Summary

- Focusing on the operator
  - Today's sonar/combat systems may benefit from a fresh look at a system approach that includes the operator.
- Finding the balance
  - What can the operator do best, what can the machine do best, and how do we build a system from there.
- Taking the risk
  - Rewards often come with risks
  - How do we minimize them
- Demonstrating results
  - What are the gains, how do we measure them today, and how can we measure them better in the future
- Getting Started
  - Start asking Why and How

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